HOW THE AMENDMENTS CLARIFY AND LIMIT THE CLAIMS

The prior amendment of 3/06/2007, which added the words "through non-slip contacts", further clarified the determinant built-in type of contact that tightly grips the material and prevents shear stress in the gripped portion of the work piece. This type of contact is not specified or claimed by Leese. This amendment limits the claims to only the type of gripping that is non-slip, and avoids all references that do not utilize non-slip contacts.

The first underlined portion of the present amendment "and constant" further clarifies that the torque couple applied to the work piece and hence the bending stress on the work piece is constant throughout the bending process avoiding excessive working of the material and better controlling the bending process and the bending stresses in the work piece, which better controls the stress concentrations in the finished work piece. This type of torque couple is not specified or claimed by Fuchs or Leese. This amendment limits the claims to only constant torque couples and avoids all references that do not utilize constant torque couples.

The second underlined portion of the present amendment "that have axis of rotation that are parallel to each other and intersect the elongate material perpendicular to the elongate axis of the elongate material" further clarifies that the torque couples are transmitted through mid material grippers and not edge grippers, and that the axis of rotation of the torque couples intersects the elongate axis of the work piece so that shear stresses can be avoided, a pure bending moment can be created, and a variety of bend radii and bend locations over a long work piece can be made. This type of mid material gripping is not specified or claimed by Fuchs or Leese. This condition of torque couple axis intersecting the elongate axis of the material is not

specified or claimed by Fuchs and is not claimed by Leese. This amendment further limits the claims to only the type of bending that utilizes mid material gripping and also limits the claims to only the type of bending that utilizes torque couples that intersect the elongate axis of the material, and avoids all references that do not utilize mid material gripping and all references that do not utilize torque couples intersection the elongate axis.

The third underlined portion of the present amendment "and constant" further clarifies that the rate of bending is constant throughout the bending process, which avoids unneeded excess working of the work piece and unneeded excessive stress concentrations and allows for better controlling of the bending stresses and the bending process. This is not specified or claimed by Fuchs or Leese. This amendment further limits the claims to only the type of bending that utilizes constant bending rates, and avoids all references that do not utilize constant rates of bending.

APPLICATION SUPPORT FOR THE AMENDMENTS

The amendments are not new material, but only clarify what was originally claimed. The amendments are covered by the specification, drawings, and claims of the original Application. The prior amendment of 3/06/2007 that added the words "through non-slip contacts" is supported by the Application. Non-slip contacts are described by the preferred embodiment of the method having a "material interface assembly 15 that **securely** holds the elongate material 1" (page 8). The "material interface insert 21 is designed to act like a **cushion sandwiched** between the material interface frame 22 and the elongate material 1" (page 11-12) and "is designed to fit **snugly**… and **securely** around the elongate material 1" (page 12) with "a **snug**

grip" (page 12) that is "**squeezed**.. providing a **tighter grip**" (page 12). This provides "a **secure**… **grip** on the elongate material" (page 16). Drawing 2 of the Application depicts the complete elongate bender machine and shows the relationship between the material interface assemblies and the rest of the machine and it can be seen that the elongate material fits in a clamp shaped like the cross section of the material, that then is screwed tightly shut, which is a tight non-slip contact. Drawing 6 of the Application depicts the material interface assembly and shows that the material interface insert 21 is designed with a slot cut in it that closes tighter around the material when the clamp is screwed shut, which is a tight non-slip contact.

The first underlined portion of the present amendment "and constant" claiming constant torque magnitude is supported by the Application. The bending torque is specified as being created by gearmotors attached to gearboxes that are then directly connected to the material through material interfaces, which creates constant torque and maintains the constant nature of the torque through direct connection to the material, and not through cable pulled levers or other uneven transfer methods. Only a method of bending with constant torque and constant bending moment will "**minimiz[e]** stress concentrations caused by **bending work**" (page 5). Constant torque is required since the method will "**continually maintain** a pure bending moment" (page 6 and 17). Constant torque is utilized since the preferred embodiment of the method has a computer control program "to **determine** what **magnitude of bending moment** is required to bend the elongate material" (page 7). Constant torque is specified since "**all of the torque** of the gearbox 12 can be **transferred to the material**" (page 9). Constant torque is required since the method of bending causes a "**minimal amount of stress concentrations** from the bending process" (page 17), and a changing torque causes stress concentrations due to excess material

working and fatigue. The Application also requires constant torque since it specifies a "**constantly** pure bending moment" (page 17). The Application claims constant torque since it claims "a pair of torque couples of **equal magnitude** that are **evenly** rotationally displaced at **equal rates** in opposite directions simultaneously… such that a pure bending moment is **maintained through out the duration** of the bending process" (claim 1). The Application also claims constant torque since it claims "there is a minimum of stress concentrations in the elongate material caused by the bending process" (claim 2), and changing torque would cause extra fatigue and working of the material resulting in extra stress concentrations. The Application also claimed constant torque by claiming "a **gearmotor** coupled to **a gearbox** coupled to a low contact stress **material interface that transfers torque** to the elongate material" (claim 3), which would create constant torque. The Application also claimed constant torque by claiming a control program in claim 5 that would calculate the bend formula and then control the machine to perform that bend formula, which would utilize constant torque. The Application also claimed constant torque by claiming that "the rotational displacement… is **equal in magnitude and rate at all times**" (claim 7). Drawing 1and 2 of the Application depict the complete method and preferred embodiment and it is apparent that there are no mechanical components or geometry that would cause the torque to vary during the bending process. Drawing 10 of the Application shows the preferred embodiment of the control circuitry and it is apparent that there are no electrical components that would cause the torque to vary during the bending process. Drawing 11 of the Application shows the preferred embodiment of the bender control program and it is apparent that there are no steps in the program that would cause the torque to vary during the bending process, and the first step says "calculate the bend formula" (drawing 11) and the third step says "run the motors forward until the material interfaces are at

the maximum required displacement" (drawing 11), both of which indicate a constant torque. Throughout the Application constant torque is specified and claimed implicitly and explicitly.

The second underlined portion of the present amendment "that have axes of rotation that are parallel to each other and intersect the elongate material perpendicular to the elongate axis of the elongate material" clarifies the mid material gripping on-axis torque couples of the invention and is supported by the Application. The Application specifies that the material interfaces apply a pair of torque couples to "create a pure bending moment which **distributes** the bending stress **evenly** along the axial length and across the cross section" (page 4); edge gripping and off axis torque couples do not do this. Only the work piece of a mid material gripping on-axis torque couple will "bend in response to **only** the pure bending moment" (page 5). Only an on-axis torque couple creates "a **pure** bending moment" (page 6, 8, 16, and 17). Mid material gripping is specified by stating "material 1 is **inserted** into the material interface" (page 12). The Application also specifies mid material gripping since the program determines the "**required linear placement** of the material interface assemblies 15 **on** the elongate material before bending" (page 15), edge gripping only allows the material interfaces to be placed on the edge of the material and the length between them can then only be changed by changing the length of the material. To utilize mid material gripping the "user then **slides** the elongate material 1 **into** the... material interface assemblies... **positioned** the required linear **distance apart** and the material interface bolts 19 are **tightened**" (page 12 and 16), edge gripping would not allow the clamps to be positioned on the elongate material at various desired distances apart as mid material gripping does. The mid material gripping non-slip contacts then transfer to the elongate material torque "**couples** 2 that are **parallel to each other** and **parallel to the cross-section** of

the elongate material 1" (page 16) which is precisely what the amendment clarifies the Application as claiming: axis of rotation that are parallel to each other and intersect the elongate material perpendicular to the elongate axis. The "couples are **configured** such that they create a **pure** bending moment… [and] the pure bending moment is the **only stress** on the bending section 3" (page 16), which can only be accomplished with on-axis torque couples transferred through non-slip contacts. The Application claims on axis torque couples by claiming bending "that utilizes a **pure** bending moment… [and] that a **pure** bending moment is **maintained**" (claim 1) and that "the elongate material **bends only** as a result of the **pure** bending moment, and **no other stresses** are present… [and] there is a **minimum** of stress concentrations… caused by the bending process" (claim 2), which can only be accomplished with on-axis torque couples transferred through non-slip contacts. The Application claimed mid material gripping by claiming a "material interface that transfers… torque couples **arranged** such that the two couples create a **pure** bending moment… **over the bending section**" (claim 3) and not over the entire work piece as edge gripping would create, the bending section 3 being specified and drawn in drawing 1. The Application claimed mid material gripping by claiming a control program that would "determine the bend formula for the desires bend" (claim 5) that would include the distance between the placement of the mid material grippers. Drawing 1 depicts the arrangement of the torque couples with respect to the elongate material, and it can be easily seen that the torque couples are parallel and on-axis and intersect the elongate material some distance to the interior of the edges of the material through mid material gripping. Drawing 2 depicts the preferred embodiment and shows the mid material non-slip material interfaces being parallel and the axes of rotation of the torque couples intersecting the elongate material perpendicular to the elongate axis. Throughout the Application parallel torque couples with axes of rotation

intersecting the elongate material perpendicular to the elongate axis are specified and claimed implicitly and explicitly.

The third underlined portion of the present amendment "and constant" claiming constant rate of rotation is supported by the Application. The rotation is specified as being created by gearmotors attached to gearboxes that are then directly connected to the material through material interfaces, which creates constant rates of rotation and maintains the constant nature of the rate of rotation through direct connection to the material, and not through cable pulled levers or other uneven transfer methods. Only a method of bending with constant bending rate will "minimiz[e] stress concentrations caused by bending work" (page 5) since constant bending rate will avoid extra fatigue and extra working of the material. Constant rate of rotation is required since the method will "**continually maintain** a pure bending moment" (page 6 and 17). Constant rate of rotation is utilized since the preferred embodiment of the method has a computer control program "to **determine**… the **required rotational displacement** of the bending moment producing couples to accomplish the desired plastic bend" (page 7), the rate of rotation will be constant. Constant rate of rotation is required since the method of bending causes a "**minimal amount of stress concentrations** from the bending process" (page 17), and a changing rate of rotation causes stress concentrations due to excess material working and fatigue. The Application also requires constant rate of rotation since it specifies a "**constantly** pure bending moment" (page 17). The Application claims constant rate of rotation since it claims torque couples "that are **evenly rotationally displaced at equal rates** in opposite directions simultaneously… such that a pure bending moment is **maintained throughout the duration** of the bending process by **accommodating** the changing geometry of the deforming elongate

material" (claim 1). The Application also claims constant rate of rotation since it claims "there is a minimum of stress concentrations in the elongate material caused by the bending process" (claim 2), and changing rate of bending would cause extra fatigue and working of the material resulting in extra stress concentrations. The Application also claimed constant rate of rotation by claiming "a **gearmotor** coupled to **a gearbox**... arranged such that the two couples create a pure bending moment" (claim 3), which would create constant rate of rotation. The Application also claimed constant rate of rotation by claiming a control program in claim 5 that would calculate the bend formula and then control the machine and "the rotational displacement of the two gearmotors" (claim 5) to perform that bend formula, which would utilize constant rate of rotation. The Application also claimed constant rate of rotation by claiming that "the rotational displacement... is **equal in magnitude and rate at all times**" (claim 7). Drawing 1and 2 of the Application depict the complete method and preferred embodiment and it is apparent that there are no mechanical components or geometry that would cause the rate of rotation to vary during the bending process. Drawing 10 of the Application shows the preferred embodiment of the control circuitry and it is apparent that there are no electrical components that would cause the rate of rotation to vary during the bending process. Drawing 11 of the Application shows the preferred embodiment of the bender control program and it is apparent that there are no steps in the program that would cause the rate of rotation to vary during the bending process, and the first step says "calculate the bend formula" (drawing 11) and the third step says "run the motors forward until the material interfaces are at the maximum required displacement" (drawing 11), both of which indicate a constant rate of rotation. Throughout the Application constant rate of rotation is specified and claimed implicitly and explicitly.

NECESSITY OF THE AMENDMENTS AT THIS TIME

The substance of these amendments was intended to be explicitly covered in the original claims. The necessity for greater clarification and narrowing of the scope of the claims became apparent to the Applicant only the last Office communication. The Examiner cited new objections and new references of which the Applicant was previously unaware. The Applicant was unaware of some of the unintended mechanisms that the claims could be misinterpreted to also cover. Only now did the Applicant realize the claims could benefit from amendment to greater clarify the intended subject matter and to further narrow the scope of the claims. The amendments clarify the claims and present the claims in better form for consideration and allowability.

PATENTABLE NOVELTY THE CLAIMS PRESENT

The claims of the present Application have patentable novelty that distinguishes them from the references and the state of the art. The claims of the present Application set forth a method for bending elongate material with a pure bending moment created through mid material gripping non-slip contacts while maintaining that pure bending moment throughout the bending process through constant bending moment stress and constant rate of deformation and by accommodating the changing geometry of the deforming elongate material. No other invention uses a continually constant pure bending moment in the absence of shear stresses and all other extra stresses. No other invention creates bends with the theoretical minimum amount of stress concentrations. No other invention has the same total combination of parts and processes that the Application has.

The Application differs from Fuchs by claiming a different clamp design and by claiming a different mode of bending with compressive stresses and off-axes torque couples. The Application differs from Leese by claiming a different clamp design and by claiming a different process of bending. The Application creates less stress concentrations in the finished bent work pieces than the references do. The Application is also a better design than the references since the Application can create a variety of bend radii and bend angles at multiple locations over a single long piece of elongate material. Neither of the references expressly discloses each and every element of the claims of the Application. The proposed amendments further clarify the claims of the Application and further differentiate it from the references.

The novel material that the Application presents is not shown in prior art and is non-obvious. The subject matter that the Application seeks to patent is sufficiently different from what has been used and described before that it non-obvious to people having ordinary skill in this area of technology as evidenced by the fact that the improvements of the Application have not been utilized or entirely described by anyone prior to this Application. The claims of the Application go a step beyond the state of the art. The invention is novel and as such the Application should be allowed to be patented.

DECLARATION

Pursuant to 37 CFR 1.68 the Applicant, Vincent Craig Olsen, having been warned that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon, declares upon his honor that all statements made within this Reply document are of the Applicant's own

knowledge and are true and that all statements made on information and belief are believed to be true.

Vincent Craig Olsen

Signed this 30TH day of August 2007

CERTIFICATE OF MAILING

I, Vincent Craig Olsen, do HEREBY CERTIFY that on the 30TH day of August, 2007, I mailed a true and correct copy of this Reply document by placing said document in a first class postage paid envelope and depositing such into the U.S. Mail system addressed to:

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